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PLANS FOR DEVELOPING HUNGARIAN RIVER NAVIGATION

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Under the Five-Year Plan, Hungary's industrial production in 1954 will be twice and agricultural production $1\frac{1}{2}$ times the respective amounts produced in 1949. To implement this plan, the country's transportation system must be prepared to move a correspondingly larger volume of raw materials and finished products. With this object in view, investments in transportation facilities were increased from the 7.5 billion forints originally envisaged under the Five-Year Plan to 10 billion forints.

While technical modernization plays an important role in planning in the USSR, it is, at best, in the experimental stage in Hungary. In the field of transportation, including river navigation, technical progress is closely bound up with the reorganization of operations. The extent of technical modernization depends on two phases in river navigation: (1) traffic, i.e., the movement of freight on waterways; and (2) loading and unloading, including delivery to and from the ships.

Traffic

The term traffic includes all means of transportation which serve the movement of freight by water and, therefore, also the waterway itself. The vessels may be divided into two categories, i.e., vessels with and without motive power. The technical modernization of both categories of vessels presents a single task which, in turn may be broken down into two steps: (1) optimum utilization of vessels in service, and (2) planning of vessel types which will best satisfy the requirements of the national economy both as to the construction of the vessel and the type of motive power.

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Full Utilization of Vessels

In examining the most economic utilization of vessels it appears opportune to point out the importance of technical-economic indexes in relation to technical modernization. These indexes bring to light the real problems and embrace such subjects as efficiency of installations and equipment, extent of technical development, mechanization, economy of operations, adequacy of record keeping, etc. Proper choice, composition, and evaluation of indexes is a prerequisite for planning.

Indexes relating to tugboats include data on motive power and speed up of movement, while indexes on barges should disclose the degree to which capacity is utilized, as well as the daily average speed. Experience shows that utilization of both tugboats and barges is affected considerably by time spent in refueling, repairs, loading and unloading, as well as by water conditions. This is the most vulnerable part of water transportation, where technical improvement is most needed.

Planning Vessel Types

The objective of water transportation is to ship as much, as quickly, economically, and as safely as possible. The volume of freight is limited by the sizes of the vessels, which in turn depend on the waterways and bridges. Hungary's waterways, at present, do not permit the building of vessels with over 1,000—1,300 cubic meter water displacement. As to speed, a maximum of 22-24 kilometers per hour is still the upper limit, while the optimum towing speed is 8-10 kilometers per hour.

The planning engineer should, however, not be satisfied with the foregoing limits. He should re-examine the design of a ship from the following viewpoints: (1) the body of the vessel, (2) type of motive power, and (3) the power plant.

1. Vessel

The best way to increase the freight capacity of a vessel is to reduce its dead weight. For this purpose it is advisable to use materials of greater strength and lower specific gravity: steel alloys or light metals. However, this solution is not practical, because both metals are more expensive than the metal used at present and cannot be diverted from other branches of the national economy. Originally it was planned to use aluminum for the superstructure of the 1,000-ton barges which are being built serially at present. This solution was, however, abandoned due to the nonavailability of aluminum for this purpose.

2. Motive Power and Power Plant

Choice of the motive power is the second most important factor. Most Hungarian vessels are equipped with steam engines, which are popular due to their high degree of safety and durability. However, there are many disadvantages to steam engines. They are uneconomical, since only 6 - 8 percent of the coal fired in the boiler is utilized effectively; they require a large stoker personnel; and a great deal of time is lost in refueling, boiler washing, blowing of the tubes, etc. However, most of these drawbacks could be eliminated by modernization.

Currently, low-pressure (10-15 atmospheres) fire-tube boilers are employed. It would be advisable to convert the water-tube boilers to 30-32 atmospheric pressure. The drawback of the latter type of boiler is that

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it requires pure water and cannot use the Danube water directly. Neverthe-less, the problem deserves attention because the caloric consumption could be reduced from 6,000 - 9,000 to 4,000 calories per horsepower.

Firing by hand should be replaced by automatic firing. The mechanization of firing is a simple matter in the case of liquid fuel, but presents difficulties if coal is used. One of the main parts of a mechanized firing system is the automatic ash-removing grate, the employment of which increases boiler efficiency by 10 percent. Recently, much attention has been given in the USSR to so-called spray fueling. In this system, pulverized coal is sprayed on the grate and the ash is removed by the movement of the grate in the opposite direction.

Boiler cleaning, boiler washing, and tube blowing consume a great deal of time and together account for 25 percent of the total operating time. Boiler tubes are blown after every 135 hours of operation, and if this could be eliminated, effective operating time could be increased by 15 percent. Instead of first cooling the boiler and then heating it again, the tubes can be partially blown under normal boiler pressure. Experiments by the MESZHART (Hungarian-Soviet Navigation Enterprise) prove that accumulation of sludge in the boilers can be prevented by this method. The method here suggested, however, requires special equipment, such as ingress and exhaust valves. Boilers are washed every 400 hours, but there are encouraging indications to the effect that this period of time will be increased to 800 hours. Nevertheless, preventive measures must not be neglected and in this connection experiments are being conducted for the application of scale solvents suitable for Hungarian waters.

Steam turbines have not as yet been employed in Hungarian river navigation. Their high number of revolutions per minute pose a serious difficulty due to their complicated transmission mechanism. Generator-gas motors may be considered only when gas is cheap and may be produced from fuel available in large quantities. Unfortunately, Hungarian coal is not suitable for this purpose.

Internal-combustion engines are considerably more efficient, can be refueled in a shorter time, are lighter, and require less space. On superficial examination it would appear that this type of motive power should replace steam. However, due to the vibration caused by the engines the weight saved must be built into the body of the vessel to achieve a great degree of stability. Moreover, the engines wear out rapidly. In tugboats, internal-combustion engines have the added disadvantage that the tugs cannot be overloaded. Diesel engines represent the most advanced type of motive power. Nevertheless, after consideration of all factors, it is safe to say that modern steam engines will be employed in Hungarian navigation for a long time. The main consideration in this respect is that it is more advantageous for the national economy to use coal mixtures than oil as fuel.

Hungarian vessels are driven either by propellers or by wheels. In shallow water, wheels are used exclusively. In regard to standardization, a modern vessel type has to be developed. This question is important from the viewpoint of repairs, prefabricated parts, training of the crews, norms, etc.

Barges

The capacity of barges varies between 100 and 1,000 tons. Since freight for barges is provided under Hungary's planned economy throughout the year, the emphasis is shifting toward the 1,000-ton type. The 1,000-ton barge built by the Ganz Shipyards seems to be the most suitable because it has the least

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towing resistance and the greatest capacity. A series of these barges will be built in the course of the Five-Year Plan. The first few have been tested and proved practical. On tributary and rapid rivers, where the 1,000-ton vessels are unsuitable, the 400-ton type is used. Construction of larger barges should be given precedence because of economies in operation. While a 100-ton barge requires a crew of two, a 1,000-ton barge is manned by a crew of only three.

Seagoing Vessels

For the sake of completeness, a few words should be said about Hungary's seagoing vessels. At present, Hungary has four such ships which carry on trade with the Near East. The capacity of the seagoing ships varies between 450 and 1,200 tons and the government is planning to build 1,300-ton ships in the future.

New ships are being built for navigation on Lake Balaton, including a 600-ton vessel. Development is here limited by the small harbors, as well as by the shallow waters on the southern banks of the lake which require a great deal of dredging

Danube and Tisza Rivers

The Danube and Tisza rivers constitute Hungary's main water arteries. A 440-kilometer sector of the Danube falls within the borders of Hungary and this sector is divided into two parts with Budapest as the point of division. River regulation south of Budapest is feasible and could increase the depth from the present 2.5-3 meters to 3.5-4 meters. The depth of the Danube north of Budapest could also be regulated so that the depth of the water would be increased from 2 meters to 2.5 meters. Danube regulation is, however, dependent on river shipping, because the required amount of stone and gravel must be delivered on the building sites by vessels. A depth of 3.5-4 meters along the Danube south of Budapest would enable seagoing vessels to reach Budapest.

Regulation of the Hungarian sector of the Danube would be economical only if the states along the lower Danube will also regulate their sectors. Since the Danube is an international river, its regulation is subject to the jurisdiction of the Danube Commission of Galati, Rumania, composed of the representatives of all Danubian states.

Regulation of the Tisza River raises different problems. Navigation on the Tisza was more extensive in the first half of the past century than 100 years later. Although river regulation reduced the length of the Tisza by one third, at the same time, the rate of flow of the water increased. Shallow water became shallower and deep water deeper. In the central sector of the Tisza the water is barely 40 - 50 centimeters deep at present, compared with 2.5 meters many decades ago.

The comprehensive Tisza River regulation plan was designed to eliminate all these disadvantages. While assuring a permanently safe water level for navigation, regulation will also promote irrigation and the generation of hydroelectric power. If four locks are built, the dammed-in water will remain in the river bed everywhere. The first lock is now being built at Tiszalok and the others will be built at Tiszafured, Szolnok, and Szeged. The locks were designed to enable 1,000-ton barges to pass the dams.

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Regulation of the Tisza will result in a secure 535-kilometer-long waterway, approximately 100 kilometers of which will be created by raising the levels of tributaries. Among the tributaries, regulation of the Sajo River is particularly important. After its completion, iron ore coming from the USSR will be transloaded to river barges at Csap and will be shipped by water directly to the iron and steel works near Miskolc [Diosgyor and Ozd.]

Loading

Shortening of the turnaround time of a barge depends on the time required for loading, towing and unloading. Regardless of increased towing speed, the turnaround time cannot be reduced unless loading and unloading operations are considerably better organized.

The cardinal rule of forwarding freight is regularity. Regularity is the result of a rhythmic, continuous flow of traffic and of loading operations. Delay in loading upsets shipping regularity. Freight forwarding can be improved considerably through the mechanization of loading. By eliminating manual operations, productivity increases and manpower is liberated for other areas of national economy. Technical modernization does not, however, consist of the installation of new machinery alone, but also requires the improved use of existing equipment. In other words, a considerable increase in productivity may be achieved without additional investments.

The building of ports and wharves with special regard to maximum and minimum water levels is a prerequisite for the mechanization of loading operations. It is also essential that good connecting roads, together with suitable warehouses, be maintained. The size of the wharves, as well as their maintenance, depends on the average traffic during the various seasons.

In planning the mechanization of loading operations it is important to know whether traffic is continuous, seasonal, or occasional. The mechanization of loading in industrial centers along the waterways has a great influence on the development of these centers. At the same time, such great centers as the Danubian Ironworks at Dunapentele require special loading installations.

In the case of seasonal wharves it is seldom good practice to install permanent loading equipment, because of the seasonal movement of freight, for example, sugar. However, most barges are loaded at so-called occasional wharves, where conditions are usually very unfavorable, resulting in long delays. It is, therefore, a primary problem of river navigation that the question of mechanization at seasonal or occasional wharves be solved. In these cases, the solution lies in the employment of portable equipment, mobile docks, etc.

Hungary's river navigation accounts for approximately 13 percent of the total freight. This is a large quota, especially if the high development of the country's railroads is compared with the present state of river navigation. It will be the task of river navigation to supply the Danubian Ironworks with raw materials and to move its finished products. Even now, most of the material for the construction of the ironworks arrives at Dunapentele by water. The materials for the construction of the Tiszalok Hydroelectric Works are also shipped by water. As in the USSR, Hungarian river navigation will have the task of delivering materials and equipment for hydroelectrical installations to be built in the future.

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